(19) World Intellectual Property Organization

International Bureau

(43) International Publication Date

20 October 2005 (20.10.2005)





(10) International Publication Number WO 2005/097676 A3

(51) International Patent Classification':

(21) International Application Number:

PCT/US2005/010218

D01F 9/12

(22) International Filing Date: 23 March 2005 (23.03.2005)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

26 March 2004 (26.03.2004) 60/556,503

(71) Applicant (for all designated States except US): LUNA INNOVATIONS INCORPORATED [US/US]; 2851 Commerce Street, Blacksburg, Virginia 24060 (US).

(72) Inventor; and

(75) Inventor/Applicant (for US only): STEVENSON. Steven, A. [US/US]; 508 Alleghany Street, Blacksburg, Virginia 24060 (US).

(74) Agents: DADIO, Susan, M. et al.; Burns, Doane, Swecker & Mathis, LLP, P. O. Box 1404, Alexandria, Virginia 22313-1404 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, $KG,\,KP,\,KR,\,KZ,\,LC,\,LK,\,LR,\,LS,\,LT,\,LU,\,LV,\,MA,\,MD,$ MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments
- (88) Date of publication of the international search report: 12 January 2006

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.



(54) Title: METHOD OF MAKING MULTIPLE CARBONACEOUS NANOMATERIALS

(57) Abstract: A method of making multiple carbonaceous nanomaterials is provided. Embodiments of the method can produce a reaction product that includes trimetaspheres, nanotubes, and at least one of fullerenes and metallofullerenes. A preferred embodiment of the method includes reacting at least one carbon source, nitrogen source, copper source, yttrium source, transition metal, and trimetasphere-forming metal in a reaction chamber. The reaction product can be produced by arc discharge in the presence of nitrogen gas.